SAMPLING AND ANALYSIS PLAN GUIDANCE

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Sampling and Analysis Plan

(Field Sampling Plan and Quality Assurance Project Plan)

with Guidance

Prepared by: Quality Assurance Program

United States Environmental Protection Agency

Region IX

75 Hawthorne Street

San Francisco, CA 94105

March 1997

This Sampling and Analysis Plan (SAP) was prepared to assist in the preparation of a combined Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) for one-time and short-term field sampling events. It was prepared using the guidance document EPA Requirement for Quality Assurance Project Plans for Environmental Data Operations (QA/R-5), August 1994; Guidance for the Data Quality Objectives Process (QA/G-4), September 1994; and FSPs for previous sampling events sponsored by the Site Evaluation and Grants Section, EPA Region IX. This SAP includes sampling of surface and subsurface soil, sediment, surface and ground water, and other matrices. Exceptions to the procedures contained herein will occur, and generic sections may need to be modified or new project-specific sections may need to be written. For ease in developing a project-specific SAP, an electronic template (in WordPerfect 6.0) is available upon request. The electronic template includes the SAP and the accompanying guidance for completing each section.

The Sampling and Analysis Plan (SAP) documents the procedural and analytical requirements for a one--time or time--limited project involving the collection of water, soil, sediment or other samples to characterize areas of potential environmental contamination. It contains all the elements of a Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP) that must be included in order to meet the requirements for any U.S. Environmental Protection Agency (EPA) funded project in which environmental measurements are to be taken. ***The format is designed for projects of limited scope that may also need to be developed on short notice. It should be used for no more than 20 samples or for samples collected over a period of not more than 14 days. It is assumed that the requested analyses will be performed by the EPA Region IX Laboratory****.*

This guide provides item--by--item instructions for filling out the SAP form. More complete information is provided for completing Sections 6.0 through 9.0 (sampling procedures). If these sections are appropriate for the project, they may be used verbatim or with project-- and site--specific modifications. An electronic version (WordPerfect 5.2 or 6.0 format) of the guide is available upon request to be used for this purpose.

U.S. EPA Region IX Quality Assurance (QA) Program staff is available to provide assistance to complete the SAP. Please call 415--744--1636, Monday through Friday, 7:30 a.m. to 5:00 p.m.

1.0 INTRODUCTION

This section should include a general description of the project, including the history, objectives, scope of sampling effort, and types of analyses that will be required. Data uses should also be discussed.

1.1 SITE NAME

Provide the most commonly used name of the site.

1.2 SITE LOCATION

Provide the name of the region, state or reservation in which the site is located.

1.3 RESPONSIBLE AGENCY

Provide the name of the organization conducting the sampling.

1.4 PROJECT ORGANIZATION

Provide the name, title and phone number(s) of the person(s) and/or contractor working on the sampling project as listed in the table or modified for the specific project. It should be noted that it is the responsibility of the QA Officer to oversee the QA elements of the SAP, including whether the quality control procedures are being followed as described. That individual should discuss QA issues with the Project Manager, but should not be involved in the data collection/analysis/interpretation/reporting process except in a review or oversight capacity. If a staff is too small to include a QA Officer, someone who is familiar with Quality Assurance/Quality Control (QA/QC) procedures may serve in this capacity.

1.5 STATEMENT OF THE SPECIFIC PROBLEM

In describing the problem, include historical, as well as recent, information and data that may be relevant. List and briefly outline citizens' complaints, public agency inspections, and existing data. Include sources if possible.

1.6 DATA USES

Discuss how it is anticipated that the data collected will be used. Describe what actions or activities may follow from the analysis of the results of the study.

2.0 BACKGROUND

2.1 LOCATION

Two maps of the area should be provided: the first, on a larger scale, to place the area within its geographic region; the second, on a smaller scale, to mark the sampling sites within the local area. The following narrative or something similar, completed with project--specific information, should accompany the maps:

2.1.1 Geographic location: The geographic coordinates of the site are: ____ ____' ___.____"N latitude and ____ ____' ____._____" W longitude. The geographic location of the site is shown in Figure 2.1(not included).

If the geographical coordinates are not known, describe the location as fully as possible, relating it to significant landmarks.

2.1.2 Specific location: The site occupies _____[acres or square feet] in a _____[urban, commercial, industrial, residential, agricultural, or undeveloped] area. The site is bordered on the north by _____, on the west by _____, on the south by _____, and on the east by _____. The specific location of the site is shown in Figure 2.2.

2.2 GEOLOGICAL INFORMATION (Groundwater Sampling Only)

Provide a general description of the hydrogeology of the area, including depth to groundwater and direction of groundwater flow, if known.

2.3 ENVIRONMENTAL AND/OR HUMAN IMPACT

Discuss the concerns about possible and actual impacts of the contamination on human health or the environment.

2.4 PREVIOUS INVESTIGATIONS (If Applicable)

Summarize all previous sampling efforts at the site. Include the sampling date(s); the name of the party(ies) that conducted the sampling; the agency for which the sampling was conducted; the rationale for the sampling; the type of medium (matrix) sampled (e.g. soil, sediment, water, other); the laboratory methods that were used. Include a discussion of what is known about data quality and usability. The summaries should be presented in subsections according to which medium was sampled and arranged chronologically. It would be helpful if the results of previous investigations were located on the map in Figure 2.2

2.5 REGULATORY INVOLVEMENT

Describe any relevant government agency involvement, including any local, state, tribal or federal government activities, past and present.

3.0 PROJECT DATA QUALITY OBJECTIVES

3.1 DATA USES

Describe how the data will be used and what decisions will be made based on the results.

3.2 PROJECT TASK

Describe the project. Include all measurements to be made in whatever medium (soil, sediment, water, other) is (are) to be sampled. Explain how the work will relate to the problem described above. Include action levels.

3.3 EXPECTED DATA QUALITY

Data quality refers to the level of uncertainty associated with a particular data point (value). It answers the question: How sure are you that the value of the data point is what the analysis has determined it to be? All the elements of the sampling event, from the sampling design through the laboratory analysis and reporting, affect the quality of the data. The project manager must make the decision as to what level of uncertainty is acceptable or appropriate. The decision will depend on the contaminant of concern, and the effect on human and environmental health.In order to be able to make the decision, the following questions should be considered:

1) What chemical(s) are expected to be found at the site?. . . . . .

2) Approximately what level of contamination is expected (high = 10 parts per million (ppm); medium = 10 ppm to 10 parts per billion (ppb); low = ppb)? . . . . . .

3) What is the action level or level of concern for the contaminant for human health? for the environment? These may be taken from the Maximum Contaminant Levels (MCLs) for drinking water, Preliminary Remediation Goals (PRGs) for superfund sites or Ambient Water Quality Criteria (AWQCs) for aquatic environments. . . . . .

4) Based on the answers to 1), 2) and 3), which analytical methods are appropriate to achieve needed detection limits?. . . . . .

5) How was the sampling design developed (e.g., area vs. number of samples; frequency of sampling; random or biased sampling)? . . . . . .

6) How many of the samples will be quality control (QC) samples, i.e., duplicate, field, equipment, trip, spike or split samples? The Region recommends that the following number of QC samples be collected: . . . . . .

1 field duplicate per 10 samples, taken at a site where the contaminant of concern is expected to be at a medium concentration;

1 field equipment blank per 10 samples;

1 laboratory QC sample per 20 samples, i.e., a double volume of one sample .

3.4 DATA QUALITY INDICATORS

The data quality indicators, precision, accuracy, completeness, detection limits, representativeness and comparability, relate to various aspects of the data gathering, or sampling and analyzing, activity. As these data quality indicators are defined specifically for the project, the level of uncertainty expected to be associated with each datum is determined.

*The values that are to be assigned to the **quantitative** data quality indicators (accuracy, precision, completeness, and detection limits) and statements concerning the **qualitative** indicators (representativeness and comparability) are determined by the answers to the questions in Section 3.3.*

***Accuracy** is the degree of agreement of a measurement with a known or true value. To determine accuracy, a laboratory or field calibration value is compared to the known or true concentration. Accuracy is usually assessed through the use of spiked samples (e.g., matrix spikes or surrogate spikes) or the analysis of a sample of known concentration (e.g., a performance evaluation sample or laboratory control sample [LCS].) In the field, calibration with prepared standards provides information about the accuracy, or bias, of a field instrument. . . . . .*

***Precision** is the degree of mutual agreement between or among independent measurements of a similar property (standard deviation [SD] or relative percent difference [RPD]). This indicator relates to the analysis of duplicate laboratory or field samples. An RPD of £20% (water) or £35% (soil) is generally acceptable, depending upon the chemical and matrix being analyzed.. . . . . .*

***Completeness** is expressed as the amount of usable data obtained compared to the amount that was expected to have been obtained. Due to a variety of circumstances, sometimes not all samples collected can be analyzed. The percent completeness required will depend on data use and decisions to be made*

based on those data. Expectation of completeness should be higher the fewer the number of samples taken per event or site. . . . . . .

Representativeness *is the expression of the degree to which data accurately and precisely represent a characteristic of an environmental condition or a population. It relates both to the sampling area and to the sampling procedures. The idea of representativeness should be incorporated into discussion of sampling design.* . . . . . .

Comparability *expresses the confidence with which one data set can be compared to another. The use of standard, published methods allows the data to be compared to data from other projects; using the same methods throughout allows for comparison of data within a project. Expressing data using consistent units of measure also addresses comparability.* . . . . . .

Detection Limits *for analyses must be included in this section. These limits should be related to any decisions that will be made as a result of the data collection effort. In addition, they should be related to any regulatory or action levels that may apply.* . . . . . .

Data Quality Indicators*: Fill out the table, listing all the parameters to be measured. Accuracy and precision may not be relevant to all measurements.*

Representativeness: *Provide a statement that describes how representativeness is to be achieved during this sampling effort. How will the sample design ensure that the area of concern has been adequately characterized? How will the sampling method ensure that a characteristic sample is taken?*

Comparability: *Consistent use of standardized analytical methods, similar reporting units and standardized data report formatting contribute to data comparability. Describe the elements in this study that will ensure comparability within the project and with other projects.*

3.5 DATA MANAGEMENT

Provide a list of the steps that will be taken to ensure that data are transferred accurately from collection to analysis to reporting. Discuss the measures that will be taken to review data collection processes, including field notes or field data sheets, laboratory report, and the data entry system, and reports. A checklist would be acceptable.

3.6 ASSESSMENT OVERSIGHT

Describe the procedures by which the Quality Assurance Officer will implement the QA Program. Indicate how often a QA review of the different aspects of the project, including audits of field and laboratory procedures, will take place. Describe what procedures will be followed to correct field and analytical problems. Discuss the process by which the evaluation of data quality will be made. Describe how data that do not meet data quality objectives will be designated.

4.0 SAMPLING DESIGN

4.1 SOIL

4.1.1 Sampling Locations

Provide a general overview of the soil sampling event. Present the rationale for choosing each sampling location at the site, including the depths at which the samples are to be taken, if relevant. If locations will be determined in the field, refer to Section 6.3.1, paragraphs 2 and 3.

4.1.2 Analytes of Concern

List the analytes of concern at each location. Explain why the specific chemical or group of chemicals (e.g., polychlorinated biphenyls [PCBs], pesticides) has been included.

4.2 SEDIMENT

4.2.1 Sampling Locations

Provide a general overview of the sediment sampling event. Present the rationale for choosing each sampling location at the site, including the depths at which the samples are to be taken, if relevant.

4.2.2 Analytes of Concern

List the analytes of concern at each location. Explain why each chemical or group of chemicals (e.g., PCBs, pesticides) has been included.

4.3 WATER

4.3.1 Sampling Locations

Provide a general overview of the water sampling event. Present the rationale for choosing each sampling location at the site. List the types of wells to be sampled, including the depths at which the samples are to be taken.

4.3.2 Analytes of Concern

List the analytes of concern at each location. Explain why each chemical or group of chemicals (e.g., PCBs, pesticides) has been included.

4.4 OTHER MEDIA (MATRICES)

4.4.1 Sampling Locations

Provide a general overview of the sampling event, including a description of the matrix to be sampled. Present the rationale for choosing each sampling location and/or type of matrix at the site, including the depths at which the samples are to be taken, if relevant.

4.4.2 Analytes of Concern

List the analytes of concern at each location. Explain why the specific chemical or group of chemicals (e.g., PCBs, pesticides) has been included.

4.5 SAMPLE IDENTIFICATION

Fill out Table 4.1, including all matrices (ground water, soil, sediment or other) to be tested, using a project--specific identification system. Include a copy of the list in the field notes. Provide best estimates for sampling depths. (Tables are in a separate file called: TABLES.PDF)

Here is an example of a numbering system:

For sample identification, letters will be used to identify the site and type of sample (e.g. Site A, Water), consecutive numbers will be used for the sample (A--W--1), and a second number will indicate the depth in feet from the surface at which the sample was collected (A--W--1--1 = a surface soil sample collected from sample location A--W--1 at a depth of 1 foot below ground surface (bgs); A--W--1--2 = a soil sample collected from sample location A--W--1 at a depth of 2 feet bgs, etc).

Use this example, modify it, or develop one for the project. Describe the identification numbering system in this section.

4.6 SAMPLE PRESERVATION AND HOLDING CONDITIONS

Tables 4.2 and 4.3 list the types of chemical analyses, and Table 4.4 lists bacteriological analysis that may be requested for each sample matrix, depending. Sample preservation and holding conditions are specified. Use these tables to fill in the Request for Analysis (RFA) tables in Section 5.0.

TABLE 4.2

Recommended Sample Containers*, Preservation and Holding Times for Chemical Analysis

Chemical	Water	Soil, Sediment, Other	Preservation	Holding Time
Volatile Organic Compounds (VOCs)	Three 40mL volatile organic analysis (VOA) vials fitted with Teflon septa	Two 120mL wide--mouth glass jars with Teflon septa, brass tube, or stainless steel tube	Chill to 4°C For liquid samples, add hydro-chloric acid (HCl) to <pH2	14 days
Semi--volatile OrganicCompounds(SVOCs)	Two 1L amber glass bottles with Teflon septa	One 8oz wide--mouth glass jar with Teflon septum, brass tube, or stainless steel tube	Chill to 4°C	7 days (water) 14 days (soil)
Metals	One 500mL polyethylene bottle	One 8oz wide--mouth glass jar, or two 4oz wide mouth glass jars	Chill to 4°C For liquid samples, add nitric acid (HNO_3) to	180 days
Mercury	One 500mL polyethylene bottle	One 8oz wide--mouth glass jar, or brass tube	Chill to 4°C	28 days
Total Petroleum Hydrocarbons (TPHs)	Three 40mL VOA vials (gasoline) or one 1L glass bottle with Teflon septa (diesel)	One 8oz wide--mouth glass jar with Teflon septum, brass tube, or stainless steel tube	Chill to 4°C For liquid samples, add HCl to	7 days (water--diesel) 14 days (soil --VOCs)
Total Recoverable Petroleum Hydrocarbons (TRPHs)	One 1L glass bottle with Teflon septum	One 8oz wide--mouth glass jar with Teflon septum, brass tube, or stainless steel tube	Chill to 4°C For liquid samples, add HCl to pH	7 days (water) 14 days (soil)

Notes: *For laboratory quality control samples, collect a double volume of waters.

TABLE 4.3

Recommended Sample Containers*, Preservation and Holding Times for RCRA Analysis[#]

Chemical	Water	Soil, Sediment, Other	Preservation	Holding Time
VOAs	Two 40--ml VOA vials fitted with Teflon septa and two 1L amber glass bottles with Teflon septa	Two 120mL wide--mouth glass jars with Teflon septa, brass tube, or stainless steel tube	Chill to 4°C	14 days
SVOCs	Two 1L amber glass bottles with Teflon septa	One 8oz wide--mouth glass jar with Teflon septum, brass tube, or stainless steel tube	Chill to 4°C	14 days
Metals	One 1L polyethylene bottle	One 8oz wide--mouth glass jar with Teflon septum	Chill to 4°C	180 days
Mercury	One 1L polyethylene bottle	One 8oz wide--mouth glass jar with Teflon septum, brass tube, or stainless steel tube	Chill to 4°C	28 days

Notes:*For laboratory quality control samples, collect a double volume of waters.

[#]RCRA analytical methods do not include TPH and TRPH.

TABLE 4.4

Recommended Sample Containers, Preservation and Holding Times for Bacteriological Analysis

Analysis	Container	Sample Volume	Method of Preservation	Holding Time
Total Coliform Fecal Coliform E. Coli	**Sterile plastic or glass with lid**	**100mL**	**Chill to 4°C**	**6 hrs (fresh, sea or brackish water) 30 hrs (treated water)**

5.0 REQUEST FOR ANALYSES

5.1 REQUEST FOR ANALYSES TABLES

A Request for Analyses (RFA) table for each matrix to be sampled must be included in the SAP. Each table must list analytical parameters for each type of sample. Include information on container types, sample volumes, preservatives, special handling and analytical holding times for each parameter. Field QC samples and laboratory QC samples should be indicated in the column titled "Special Designation." If extra volume is needed for laboratory QC samples (for water samples only), this should be noted on the table. Complete the narrative subsection which summarizes each table.

5.2 ANALYSES NARRATIVE

Include any special requests, such as fast turn--around time (2 weeks or less), specific QC requirements, or modified sample preparation techniques in this section. An example of the narrative follows:

As enumerated in Table 5--__, ____[*matrix, e.g., soil*] samples will be taken at ____[*total number of locations*] locations: _____[*sample location numbers*]. _____[*"Single" or "Double" depending on laboratory requirements*] volume ____[*matrix*] samples collected at the following sample locations will be identified for use as laboratory QC samples: _____[*QC sample numbers*]. Duplicate ____[*matrix*] samples will be collected at the following sample locations: _____[*locations for sample duplicates*].

As shown in Table 5--___, each _____[*matrix*] sample, including laboratory QC samples, will be analyzed for _____[*include list of requested analyses*].

The following sections (Sections 6.0 through 9.0) may be used verbatim, or modified to document project-specific procedures.

6.0 METHODS AND PROCEDURES

In the general introductory paragraph to this section, there should be a description of the methods and procedures that will be used to accomplish the sampling goals, e.g., "...collect soil, sediment and water samples"]. It should be noted that personnel involved in sampling must wear clean, disposable latex gloves. Reference should be made to the specifications for container and preservation requirements listed in Section 4.0, Tables 4.2, 4.3 or 4.4. A general statement should be made that refers to the sections containing information about sample tracking and shipping.

6.1 FIELD HEALTH AND SAFETY PROCEDURES

Describe any agency--, program-- or project--specific health and safety procedures that must be followed in the field, including safety equipment and clothing that may be required, explanation of potential hazards that may be encountered, and location and route to the nearest hospital or medical treatment facility. A copy of the organization health and safety plan may be included in the Appendix and referenced in this section.

6.2 FIELD PROCEDURES

6.2.1 Equipment

List all the equipment that will be used in the field to collect samples, including decontamination equipment, if required. Discuss the availability of back--up equipment and spare parts.

6.2.1.1 Equipment Calibration and Maintenance

Describe the procedures by which field equipment is prepared for sampling, including calibration standards used, frequency of calibration and maintenance routines. Indicate where the equipment maintenance and calibration records for the project will be kept.

6.2.2 Field Sampling Procedures

Provide a description of sampling procedures. Attach a copy of all Standard Operating Procedures (SOPs) for field sampling, if available.

6.2.3 Field Notes

6.2.3.1 Field logbooks

Use field logbooks to document where, when, how, and from whom any vital project information was obtained. Logbook entries should be complete and accurate enough to permit reconstruction of field activities. Maintain a separate log book or sheets for each sampling event or project. Logbooks should have consecutively numbered pages. All entries should be legible, written in black ink, and signed by the individual making the entries. Use factual, objective language.

At a minimum, the following information should be recorded during the collection of each sample:

Sample location and description

Site sketch showing sample location and measured distances

Sampler's name(s)

Date and time of sample collection

Designation of sample as composite or grab

Type of sample (soil, sediment or water)

Type of sampling equipment used

Field instrument readings

Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)

Preliminary sample descriptions (e.g., for soils: “clay loam, very wet”; for water: “clear water with strong ammonia--like odor”)

Sample preservation

Lot numbers of the sample containers, sample identification numbers and explanatory code, chain--of--custody form numbers, and custody seal numbers

Shipping arrangements (overnight air bill number)

Name(s) of recipient laboratory(ies)

In addition to the sampling information, the following specific information may also be recorded in the field logbook for each day of sampling:

Team members and their responsibilities

Time of site arrival/entry on site and time of site departure

Other personnel on site

Summary of meetings or discussions with any potentially responsible parties (PRPs), representatives of PRPs, or federal, state, or other regulatory agencies

Deviations from sampling plans, site safety plans, and QAPP procedures

Changes in personnel and responsibilities with reasons for the changes

Levels of safety protection

Calibration readings for any equipment used and equipment model and serial number

A checklist of the field notes, following the suggestions above, should be developed and included in project field notes. An example of a field data sheet is provided in Table 6.1 of the SAP. Use it as is, or modify it to fit the project requirements.

6.2.3.2 Photographs

Photographs should be taken at the sample location and at other areas of interest on site. They serve to verify information entered in the field logbook. For each photograph taken, the following information should be written in the logbook or recorded in a separate field photography log:

Time, date, location, and weather conditions

Description of the subject photographed

Name of person taking the photograph

The following Sections 6.3 (soil), 6.4 (sediment), 6.5 (surface water), 6.6 (ground water) and 6.7 (other) provide standard descriptions of acceptable sampling procedures. If they are appropriate to the project, they may be incorporated into the SAP, including any changes needed to make these sections site--specific. Read the subsections carefully, as several versions are presented from which one should be chosen, depending upon the type of analyses required for the project.

6.3 SOIL SAMPLING PROCEDURES

6.3.1 Surface Soil Sampling

Use this subsection for surface soil samples that are to be collected using hand trowels. In general, hand trowels are appropriate only for samples collected within 6 inches of the ground surface.

Include this paragraph first if exact sampling locations are to be set in the field:

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features, which may indicate location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

If soil samples are to be analyzed for VOCs <u>and</u> other analytes, use this paragraph:

Surface soil samples will be collected as grab samples (independent, discrete samples) from a depth of 0 to ___[*depth*] inches* bgs. Surface soil samples will be collected using a stainless steel hand trowel. A clean or decontaminated trowel will be used at each location. Samples to be analyzed for VOCs will be collected first. Such samples will be transferred directly from the trowel into the appropriate sample containers. Samples to be analyzed for _____ [*list all analytical methods for soil samples <u>except</u> for VOCs*] will be placed in a sample--dedicated 1--gallon disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being closed to prevent potential contaminant migration to or from the sample. Sample containers will be closed as soon as they are filled, chilled and processed for shipment to the laboratory.

If soil samples are to be analyzed <u>only</u> for volatile compounds, use this paragraph:

Surface soil samples will be collected as grab samples [*independent, discrete samples*] from a depth of 0 to ___[*depth*] inches* bgs. Surface soil samples will be collected using a stainless steel hand trowel. A clean or decontaminated trowel will be used at each location. Samples will be transferred directly from the trowel into the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being closed to prevent potential contaminant migration to or from the sample. Sample containers will be closed as soon as they are filled, chilled and processed for shipment to the laboratory.

If soil samples are <u>not</u> to be analyzed for VOCs, use this paragraph:

Surface soil samples will be collected as grab samples [*independent, discrete samples*] from a depth of 0 to ___[*depth*] inches* bgs. Surface soil samples will be collected using a stainless steel hand trowel. A clean or

decontaminated trowel will be used at each location. Samples will be placed in a sample--dedicated 1--gallon disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being closed to prevent potential contaminant migration to or from the sample. Sample containers will be closed as soon as they are filled, chilled and processed for shipment to the laboratory.

** Note, if referring to sample depths in feet, change this reference accordingly.*

6.3.2 Subsurface Soil Sampling

Subsurface soil is soil collected 6" or more below the surface (agricultural or industrial land use) or 6' or more (residential use). Use this subsection if subsurface soil samples are to be collected using hand augers.

Include this paragraph first if exact sampling locations are to be set in the field:

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination [*e.g., stained soils*], and topographical features which may indicate location of hazardous substance disposal *[e.g., depressions that may indicate a historic excavation*]. Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

If soil samples are to be analyzed for VOCs <u>and</u> other compounds, use this paragraph:

Subsurface samples will be collected by boring to the desired sample depth using _____ [*whatever method is appropriate or available*]. Once the desired sample depth is reached, a _____ [*hand-- or power--operated device, such as a shovel, hand auger, trier, hollow--stem auger or split--spoon sampler*] will be inserted into the hole and used to collect the sample.

Samples to be analyzed for VOCs will be collected first. They will be transferred directly from the _____ [*sampling device*] with a clean trowel to the appropriate sample containers. A clean or decontaminated trowel will be used at each location.

Samples to be analyzed for _____[*list all analytical methods for soil samples except for VOCs*] will be transferred from the _____ [*sampling device*] to a sample--dedicated 1--gallon disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers.

Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled and processed for shipment to the laboratory.

If soil samples are to be analyzed <u>only</u> for VOCs, use this paragraph:

Subsurface samples will be collected by boring to the desired sample depth using _____ [*whatever method is appropriate or available*]. Once the desired sample depth is reached, a _____ [*hand-- or power--operated device, such as a shovel, hand auger, trier, hollow--stem auger or split--spoon sampler*] will be inserted into the hole and used to collect the sample. Samples will be transferred directly from the _____

[*sampling device*] with a trowel to the appropriate sample containers. A clean or decontaminated trowel will be used at each location.

Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled, and processed for shipment to the laboratory.

If soil samples are <u>not</u> to be analyzed for VOCs, use this paragraph:

Subsurface samples will be collected by boring to the desired sample depth using _____ [*whatever method is appropriate or available*]. Once the desired sample depth is reached, the _____ [*hand-- or power--operated device, such as a shovel, hand auger, trier, hollow--stem auger or split--spoon sampler*] will be inserted into the hole and used to collect the sample. Samples will be transferred from the _____ [*sampling device*] to a sample--dedicated 1--gallon disposable pail and homogenized with a trowel. A clean or decontaminated trowel will be used at each location.

Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed, chilled and processed for shipment to the laboratory.

Include this as the final paragraph whichever analyses are requested for soil samples:

Excess soil from the sampled interval will be repacked into the hole. Set--aside soil from the interval above the sampled interval will then be repacked into the hole.

6.4 SEDIMENT SAMPLING PROCEDURES

Include this subsection if sediment samples are to be collected.

Include this paragraph first if exact sediment sampling locations are to be set in the field:

Exact sediment sampling locations will be determined in the field. Care will be taken to obtain as representative sample as possible.

Sediment samples will be collected at a depth of _____ inches using a pre--cleaned _____ sampler.

The final paragraph describes sample homogenization, especially important if the sample is to be separated into solid and liquid phase, and container filling. Include this paragraph, or a modified form of it, for all sediment sampling. It is assumed that sediment samples will not be analyzed for VOCs. If sediment is to be analyzed for VOCs, the samples to be analyzed for VOCs should not be homogenized but rather transferred directly from the sampler into the sample container.

Material in the sampler will be transferred to a sample--dedicated 1--gallon disposable pail and homogenized with a trowel. A clean or decontaminated trowel will be used at each location.

Material from the pail will be transferred with a trowel from the bucket to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid grooves prior to being sealed in order to prevent potential contamination migration to or from the sample containers. After

sample containers are filled, they will be immediately sealed, chilled and processed for shipment to the laboratory.

6.5 SURFACE WATER SAMPLING PROCEDURES

This subsection contains information about sampling procedures in rivers, streams, lakes and reservoirs. Relevant procedures should be included under this heading with any necessary site--specific modifications. Subsections should then be renumbered accordingly.

6.5.1 Chemical Analysis Sample Collection

6.5.1.1 Sample Bottles

Depending on the type of analysis (organic or inorganic) requested, and any other project--specific analytical requirements, sample bottles should be plastic (inorganics) or glass (organics), pre--cleaned (general decontamination procedures) or low--detection level pre--cleaned (extensive decontamination procedures).

Describe the type of bottles that will be used for the project, including the cleaning procedures that will be followed to prepare the bottles for sampling.

6.5.1.2 Sampling Procedure

There are two types of water samples: grab, to be collected at one time from one location; and composite, to be collected over a period of time, usually 24 hours. Include the appropriate paragraph in this section.

Grab: The sample will be taken from flowing, not stagnant water, with the sampler will be facing upstream in the middle of the stream. Samples may be collected by hand or with a sample bottle holder. If samples are not to be taken at specific depths, the bottle will be held 6 to 12" below the surface of the water. A _____ [*specify the type of sampler, e.g., Niskin or Kemmerer Depth Sampler*] will be used if samples are taken at depths,.

Composite: A flow-- and time--proportional automatic sampler will be positioned to take samples at _____ [*sample location*] and will be held at 4°C for the duration of the sampling.

Describe the sampling procedure, including the type of sample (grab or composite), the sample bottle preparation, and the project--specific directions for taking the sample.

6.5.2 Bacteriological Sample Collection

6.5.2.1 Sample Bottles

Describe the type of bottles that will be used for the project, including the cleaning procedures that will be followed to prepare the bottles for sampling. Refer to RFA tables for acceptable type and minimum size. Pre-cleaned bottles may be obtained from a supplier or from Region IX Equipment and Materials Facility (EMFac) at 510-412-2333.

Include the following to describe bottle preparation for collecting samples for bacteriological testing:

For bacteriological sampling, sterile bottles and caps will be used. Bottles prepared to contain samples of chlorinated water will have sodium thiosulfate, at a concentration of 0.1mL of a 10% solution for each 125mL (4oz) of sample volume, placed in the bottle before it is sterilized.

6.5.2.2 Sampling Procedure

Describe the sampling procedure, including the type of sample, the sample bottle preparation, and the project--specific directions for taking the sample. Use the following paragraph.

Bacteriological samples will be grab samples, collected at one time from one location. The sample will be taken from flowing, not stagnant water, with the sampler facing upstream in the middle of the stream. Samples may be collected by hand or with a sample bottle holder. For samples taken at a single depth, the bottle will be uncapped and the cap protected from contamination. The bottle swill be plunged into the water mouth down and filled 6 to 12" below the surface of the water. A _____ [*specify the typ of sampler, e.g., Niskin or Kemmerer Depth Sampler*] will be used to take samples at depth. After filling, some sample will be poured out to leave a bottle headspace of 2.5--5cm (1--2in).

6.6 GROUNDWATER SAMPLING PROCEDURES

This subsection contains procedures for water level measurements, well purging, and well sampling. Relevant procedures should be included under this heading with any necessary site--specific modifications. Subsections should then be renumbered accordingly.

6.6.1 Water--Level Measurements

All field meters will be calibrated according to manufacturer's guidelines and specifications before and after every day of field use. Field meter probes will be decontaminated before and after use at each well.

If well heads are accessible, all wells will be sounded for depth to water from top of casing and total well depth prior to purging. An electronic sounder, accurate to the nearest +/-- 0.01 feet, will be used to measure depth to water in each well. When using an electronic sounder, the probe will be lowered down the casing to the top of the water column, and the graduated markings on the probe wire or tape will be used to measure the depth to water from the surveyed point on the rim of the well casing. [*Typically, the measuring device emits a constant tone when the probe is submerged in standing water and most electronic water level sounders have a visual indicator consisting of small light bulb or diode that turns on when the probe encounters water.*] Total well depth will be sounded from the surveyed top of casing by lowering the weighted probe to the bottom of the well. The weighted probe will sink into silt, if present, at the bottom of well screen. Total well depths will be measured by lowering the weighted probe to the bottom of the well and recording the depth to the nearest 0.1 feet.

Water--level sounding equipment will be decontaminated before and after use in each well. Water levels will be measured in wells which have the least amount of known contamination first. Wells with known or suspected contamination will be measured last.

Three alternate versions of paragraphs from subsections 6.6.2 and 6.6.3 follow. Each contains a generic description for purging and sampling wells: A) with dedicated pumps (operating supply wells); B) without dedicated pumps (sampling is to be done with bailers); and C) sampling is to be done with <u>and</u> without dedicated pumps. Use the appropriate version and delete the other two.

6.6.2 Purging

VERSION A

All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using the dedicated well pump.

VERSION B

All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using a hand pump, submersible pump, or bailer, depending on the diameter and configuration of the well. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. All tubes will be decontaminated before use in each well. Pumps will be placed 2 to 3 feet from the bottom of the well to permit reasonable drawdown, while preventing cascading conditions.

VERSION C

All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using the dedicated well pump, if present, or a bailer, hand pump, or submersible pump depending on the diameter and configuration of the well. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. All tubes will be decontaminated before use in each well. Pumps will be placed 2 to 3 feet from the bottom of the well to permit reasonable drawdown, while preventing cascading conditions.

ALL VERSIONS

Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as:

$$\mathbf{V = pd^2 h / 77.01}$$

where: . . . . . .

V is the volume of one well casing of water ($1ft^3$ = 7.48 gallons);

d is the inner diameter of the well casing (in inches);

h is the total depth of water in the well (in feet).

It is most important to obtain a representative sample from the well. Stable water quality parameter (temperature, pH and specific conductance) measurements indicate that a representative sampling is obtainable. Water quality is considered stable if, for three consecutive readings:

temperature range is no more than $\pm$1°C;

pH varies by no more than 0.2 pH units;

specific conductance readings are within 10% of the average.

The water in which measurements were taken will not be used to fill sample bottles.

If the well casing volume is known, measurements will be taken before the start of purging, in the middle of purging and at the end of purging each casing volume.

If the well casing volume is NOT known, measurements will be taken every 2.5 minutes after flow starts. If water quality parameters are not stable after 5 casing volumes or 30 minutes, purging will cease, which will be noted in the logbook, and ground water samples will be taken. The depth to water, water quality measurements and purge volumes will be entered in the logbook.

If a well dewaters during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80% of the static water column and dewatered once more. After water levels have recharged to 80% of the static water column, groundwater samples will be collected.

Note: If the equipment is available, samples from a slowly recharging well should be taken with a low-flow pump.

6.6.3 Well Sampling

Prior to sampling each well, the water level in the well will be measured as described in Section 6.6.1 and the well purged as described in Section 6.6.2 (A, B or C).

VERSION A

All wells will be sampled within 24 hours of purging. Supply wells with a dedicated pump will have samples taken directly from the tap closest to the well head. All aerators, strainers, or hoses will be removed from the tap prior to sample collection. The flow will be adjusted so that a gentle stream is obtained. [*If samples are to be analyzed for VOCs, add this sentence: "*A flow rate of less than 100 milliliters (mL) per minute is recommended for samples to be analyzed for VOCs to minimize volatilization."]

VERSION B

Prior to sampling each well, the water level in the well will be measured as described in Section 6.6.1 and the well purged as described in Section 6.6.2. Monitoring wells and other wells without a dedicated pump will be sampled using a _____[*Provide bailer description; e.g., Teflon, stainless steel*] bailer.

VERSION C

Prior to sampling each well, the water level in the well will be measured as described in Section 6.6.1 and the well purged as described in 6.6.2. Monitoring wells and other wells without a dedicated pump will be sampled using a _____ [*Provide bailer description, e.g., Teflon, stainless steel*] bailer. Supply wells with a dedicated pump will have samples taken directly from the tap closest to the well head. All aerators, strainers, or hoses will be removed from the tap prior to sample collection. The flow will be adjusted so that a gently stream is obtain. [*If samples are to be analyzed for VOCs, add this sentence: "*A flow rate of less than 100mL per minute is recommended for samples to be analyzed for VOCs to minimize volatilization."]

ALL VERSIONS

At each sampling location, all bottles designated for a particular analysis (e.g., VOCs) will be filled sequentially before bottles designated for the next analysis are filled (e.g., SVOCs). If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample identification numbers will be filled sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., VOCs designation GW--2, VOCs designation GW--4 (duplicate of GW--2), metals designation GW--2, metals, designation GW--4 (duplicate of GW--2). Groundwater samples will be transferred from the tap directly into the appropriate sample containers with

preservative, if required, chilled and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the tap to the sample container.

If samples are to be collected for VOCs, the following paragraph should be added:

Vials forVOCs analysis will be filled first to minimize the effect of aeration on the water sample. A test vial will be filled with sample, preserved with hydrochloric acid (HCl) and tested with pH paper to determine the amount of preservative needed to lower the pH to less than 2. The appropriate amount of HCl will then be added to the sample vials prior to the addition of the sample. The vials will be filled directly from the tap. The vial will be inverted and checked for air bubbles to ensure zero headspace. If a bubble appears, the vial contents will be emptied into the container used to measure purge volumes, the vial discarded, and a new sample will be collected.

If some samples for metals (or other) analysis are to be filtered, depending upon sample turbidity, the following paragraph should be added:

After well purging and prior to collecting groundwater samples for metals analyses, the turbidity of the groundwater extracted from each well will be measured using a portable turbidity meter. A column of groundwater will be collected from the well using the tap and a small amount of water will be transferred to a disposable vial and a turbidity measurement will be taken. The results of the turbidity measurement will be recorded in the field logbook. The volume of water used to measure turbidity will be discarded after use. If the turbidity of the groundwater from a well is above 5 Nephelometric Turbidity Units (NTUs), groundwater samples will consist of both a filtered and unfiltered sample. A 5--micron filter will be used to remove larger particles that have been entrained in the water sample. A sample--dedicated Teflon tube will be attached to the tap closest to the well head. The filter will be attached to the outlet of the Teflon tube. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an “F1" will represent a sample filtered with a 5--micron filter.

If samples are to be filtered for metals (or other) analysis regardless of sample turbidity, the following paragraph should be added:

Samples designated for metals analysis will be filtered. A 5--micron filter will be used to remove larger particles that have been entrained in the water sample. A sample--dedicated Teflon tube will be attached to the tap closest to the well head. The filter will be attached to the outlet of the Teflon tube. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers to which preservative has been added and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an “F1" will represent a sample filtered with a 5--micron filter.

6.7 SAMPLING PROCEDURES FOR OTHER MATRICES

Include this subsection if samples from a matrix other than soil, sediment or water are to be collected.

Include this paragraph first if exact sediment locations are to be set in the field:

Exact sampling locations will be determined in the field, based on _____. Care will be taken to obtain as representative sample as possible.

If relevant, include information about the depth to which sampling will be performed.

Samples will be collected from a depth of _____ inches using a pre--cleaned _____ sampler.

6.7.1 Other Sampling Procedures

The final paragraph should describe sample homogenization, especially important if the sample is to be separated into solid and liquid phase. If it is to be analyzed for VOCs, the samples to be analyzed for VOCs should not be homogenized but rather transferred directly from the sampler into the sample container.

Material in the sampler will be transferred to a sample--dedicated 1--gallon disposable pail and homogenized with a trowel. Material from the pail will be transferred with a trowel from the bucket to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid grooves prior to being sealed in order to prevent potential contamination migration to or from sample containers. After sample containers are filled, they will be immediately sealed, chilled and processed for shipment to the laboratory.

6.8 DECONTAMINATION PROCEDURES

This subsection should be included in all versions.

The decontamination procedures that will be followed are in accordance with approved procedures. Decontamination of sampling equipment must be conducted consistently so as to assure the quality of samples collected. All equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Disposable equipment intended for one--time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment. All sampling devices used, including trowels and augers, will be steam--cleaned or decontaminated according to EPA Region IX recommended procedures.

The following rinses, to be carried out in sequence, make up the EPA Region IX recommended procedure for the decontamination of sampling equipment:

Non--phosphate detergent and tap water wash, using a brush if necessary

Tap--water rinse

(Include the following when sampling for metals only.)

0.1 N nitric acid (HNO_3) rinse

Deionized/distilled water rinse

(Include the following items when sampling for organic compounds only.)

Pesticide--grade solvent (reagent grade hexane) rinse in a decontamination bucket

High Performance Liquid Chromatography (HPLC) organic--free water rinse

(Include the following when sampling for <u>both</u> metals and organics.)

0.1 N HNO_3 rinse

Deionized/distilled water rinse

Pesticide--grade solvent (reagent grade hexane) rinse in a decontamination bucket

HPLC organic--free water rinse

Equipment will be decontaminated in a predesignated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. Cleaned, small equipment will be stored in plastic bags. Materials to be stored more than a few hours will also be covered.

NOTE: A different decontamination procedure may be used; but if so, the rationale for using the different approach should be provided.

7.0 DISPOSAL OF RESIDUAL MATERIALS

This section describes how investigation--derived wastes (IDW) will be disposed. Generic descriptions for IDW from low--concentration soil and water sampling events are provided. Depending upon site--specific conditions and applicable federal, state, and local regulations, other provisions for IDW disposal may be required. If any analyses of IDW are required, these should be discussed. If IDW are to be placed in drums, labeling for the drums should be discussed in this section.

In the process of collecting environmental samples at the _____[*site name*] site during the site investigation (SI) [*or name of other investigation*], the _____*[name of the organization/agency*] site team will generate different types of potentially contaminated IDW that include the following:

Used personal protective equipment (PPE)

Disposable sampling equipment

Decontamination fluids

Include this bullet when sampling soils:

Soil cuttings from soil borings

Include this bullet when sampling groundwater:

Purged groundwater and excess groundwater collected for sample container filling.

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the *Office of Emergency and Remedial Response (OERR) Directive 9345.3--02* (May which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Listed below are the procedures that should be followed for handling the IDW. The procedures have enough flexibility to allow the sampling team to use its professional judgment as to the proper method for the disposal of each type of IDW generated at each sampling location:

The following information is generally appropriate for sites with low levels of contamination. If higher levels of contamination exist at the site, other disposal methods (such as the drumming of wastes) should probably be used to dispose of used PPE and disposable sampling equipment.

Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster on site. These wastes are not considered hazardous and may be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster.

Include this information if sampling for both metals and organics:

Decontamination fluids that will be generated in the SI will consist of dilute HNO_3, pesticide--grade solvent, HPLC or deionized water, residual contaminants, and water with non--phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low so as to allow disposal at the site. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide--grade solvents will be allowed to evaporate from the decontamination bucket. The HNO_3 will be diluted and/or neutralized with sodium hydroxide (NaOH) and tested with pH paper before pouring onto the ground or into a storm drain.

Include this information if sampling for metals but not organics:

Decontamination fluids that will be generated in the SI will consist of HNO_3, HPLC or deionized water, residual contaminants, and water with non--phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low so as to allow disposal at the site. The water (and water with detergent) will be poured onto the ground or into a storm drain. The HNO_3 will be diluted and/or neutralized with NaOH and tested with pH paper before pouring onto the ground or into a storm drain.

Include this information if sampling for organics but not metals:

Decontamination fluids that will be generated in the SI will consist of pesticide--grade solvent, HPLC or deionized water, residual contaminants, and water with non--phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide--grade solvents will be allowed to evaporate from the decontamination bucket.

Include this information if sampling soils:

Soil cuttings generated during the subsurface sampling will be placed back into the soil borings from which the samples were obtained. Any remaining soil cuttings will be spread around the sampling location.

Include this information if sampling groundwater:

Purged groundwater will be _____ [*depending upon the degree of groundwater contamination; site--specific conditions; and applicable federal, state, and local regulations; disposal methods will vary. Disposal methods can vary for purge water from different wells sampled during the same sampling event*].

8.0 SAMPLE DOCUMENTATION AND SHIPMENT

8.1 BOTTLES AND PRESERVATIVES

This section requires a reference to the types of bottles to be used, preparation and preservatives to be added. The agency responsible for adding preservatives should be named.

The number of sample containers, volumes, and materials are listed in Sections 4.0 and 5.0. The containers are pre--cleaned and will not be rinsed prior to sample collection. Preservatives, if required, will be added by _____[*name of agency/organization doing sampling*] to the containers prior to shipment of the sample containers to the laboratory or added to the bottles in the field.

8.1.1 Soil Samples

Include this subsection if collecting soil samples.

If requested analyses include analyses <u>other</u> than VOCs or metals, include this paragraph:

_____*[Include all requested analysis(es), e.g., "SVOCs"].* Soil samples will be homogenized and transferred from the sample--dedicated homogenization pail into 8--ounce (oz) wide--mouth glass jars using a trowel. For each sample, one 8oz wide--mouth glass jar will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

If requested analyses include VOCs, include this paragraph:

VOCs. Soil samples will be transferred directly from the sampling equipment into 120mL, wide--mouth glass jars using a trowel. For each sample, two 120mL wide--mouth glass jars will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

If requested analyses include metals, include this paragraph:

Metals. Soil samples will be homogenized and transferred from the sample--dedicated homogenization pail into 8oz wide--mouth glass jars. For each sample, one 8oz glass jar will be collected for each laboratory.

8.1.2 Sediment Samples

Include this subsection if collecting sediment samples.

If requested analyses include analyses other than VOCs or metals, include this paragraph:

_____*[Include all requested analysis(es), e.g., "SVOCs", "Metals"].* Sediment samples will be homogenized and transferred from the sample--dedicated homogenization pail into 8oz wide--mouth glass jars. For each sample, one 8oz glass jar will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

If requested analyses include VOCs, include this paragraph:

VOCs. Sediment samples will be transferred directly from the sampling equipment into 120mL wide--mouth glass vials using a trowel. For each sample, two 120mL glass vials will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

If requested analyses include metals, include this paragraph:

Metals. Sediment samples will be homogenized and transferred from the sample--dedicated homogenization pail into 8oz wide--mouth glass jars. For each sample, one 8oz glass jar will be collected for each laboratory..

8.1.3 Water Samples

Include this subsection if collecting water samples.

If requested analyses include analyses other than volatile organic compounds or metals, include this paragraph:

_____*[Include all requested analyses, e.g., "Metals, SVOCs"].* Low concentration water samples to be analyzed for _____*[Include all requested analyses, e.g., "SVOCs"*] will be collected in 1--liter(L) amber glass bottles. No preservative is required for these samples. The samples will be chilled to 4°C immediately upon collection. Two bottles of each water sample will be collected for each laboratory.

If requested analyses include VOCs, include this paragraph:

VOCs. Low concentration water samples will be collected in 40mL glass vials. 1:1 HCl will be added to the vial prior to sample collection. During purging, the pH will be measured using a pH meter on at least one vial at each sample location to ensure the pH is less than 2. The tested vial will be discarded. If the pH is greater than 2, additional HCl will be added to the sample vials. Another vial will be pH-tested to ensure the pH is less than 2. The tested vial will be discarded. The vials will be filled so that there is no headspace. The samples will be chilled to 4°C immediately upon collection. Three vials of each water sample are required for each laboratory.

If requested analyses include metals, include this paragraph:

Metals. Low concentration water samples will be collected in 1L polyethylene bottles. The samples will be preserved by adding HNO_3 to the sample bottle. The bottle will be capped and lightly shaken to mix in the acid. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH paper. The pH must be 2. The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. The samples will be chilled to 4°C immediately upon collection. One bottle of each water sample is required for each laboratory.

8.1.4 Samples of Other Matrices

Include this subsection if collecting sample other than soil, sediment or waters.

If requested analyses include analyses other than VOCs or metals, include this paragraph:

_____*[Include all requested analyses, e.g., "SVOCs"].* Samples will be homogenized and transferred from the sample--dedicated homogenization pail into 8oz wide--mouth glass jars using a trowel. For each sample, one 8oz wide--mouth glass jar will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

If requested analyses include VOCs, include this paragraph:

VOCs.. Samples will be transferred directly from the sampling equipment into 120mL wide--mouth glass jars using a trowel. For each sample, two 120mL wide--mouth glass jars will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

If requested analyses include metals, include this paragraph:

Metals. Samples will be homogenized and transferred from the sample--dedicated homogenization pail into 8oz wide--mouth glass jars. For each sample, one 8oz glass jar will be collected for each laboratory..

8.2 SAMPLE CHAIN--OF--CUSTODY FORMS AND CUSTODY SEALS

The following paragraphs provide a generic explanation and description of the use of chain--of--custody forms and custody seals. They may be incorporated as is, if they are appropriate, or modified to meet any project--specific conditions. To obtain the appropriate forms, call the Region IX Regional Sample Control Center (RSCC: 415--744--1498).

Organic and inorganic chain--of--custody records are used to document sample collection and shipment to laboratory for analysis. All sample shipments for analyses will be accompanied by a chain--of--custody record. A copy of the form is found in Appendix _. Form(s) will be completed and sent with the samples for each laboratory and each shipment [i.e., each day]. If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler.

The chain--of--custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of _____[*name of agency/ organization conducting sampling]. The site leader or designee will sign the chain--of--custody form. The site leader or designee will sign the "relinquished by" box and note date, time, and air bill number.*

A QA/QC summary form will be completed for each laboratory and each matrix of the sampling event. The sample numbers for all rinsate samples, reference samples, laboratory QC samples, and duplicates will be documented on this form (see Section 9.0). The original form will be sent to the QA Program; a photocopy will be made for the _____[*name of agency/ organization conducting sampling] master files. This form is not sent to the laboratory.*

A self--adhesive custody seal will be placed across the lid of each sample. A copy of the seal is found in Appendix _. For VOC samples, the seal will be wrapped around the cap. The shipping containers in which samples are stored (usually sturdy picnic cooler or ice chest) will be sealed with self--adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated.

8.3 LABELING, PACKAGING, AND SHIPMENT

The following paragraphs provide a generic explanation and description of the use of labels, and how to pack and ship samples. They may be incorporated as is, if they are appropriate, or modified to meet any project--specific conditions.

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. A copy of the sample label is included in Appendix __. The samples will have preassigned, identifiable, and unique numbers. At a minimum, the sample labels will contain the following information: station location, date of collection, analytical parameter(s), and method of preservation. Every sample, including samples collected from a single location but going to separate laboratories, will be assigned a unique sample number.

All sample containers will be placed in a strong--outside shipping container. The following outlines the packaging procedures that will be followed for low concentration samples.

1. When ice is used, it will be packed in zip--locked, double plastic bags. The drain plug of the cooler will be sealed with fiberglass tape to prevent melting ice from leaking. . . . . .

2. The bottom of the cooler will be lined with bubble wrap to prevent breakage during shipment. .

3. Screw caps will be checked for tightness and, if not full, will be marked with indelible ink at the sample volume level on the outside of the sample bottles. . . . . .

4. Bottle/container tops will be secured with clear tape and all container tops will have custody seals.. . . . . .

5. Sample labels will be affixed to the containers with clear tape. . . . . .

6. All glass sample containers will be protected by bubble wrap.. . . . . .

7. All sample containers will be sealed in heavy duty plastic bags. Sample numbers will be written on the outside of the bags with indelible ink. . . . . .

All samples will be placed in coolers with the appropriate chain--of--custody forms. All forms will be enclosed in a large plastic bag and affixed to the underside of the cooler lid. Empty space in the cooler will be filled with bubble wrap or styrofoam peanuts to prevent movement and breakage during shipment. Vermiculite will also be placed in the cooler to absorb spills. Bags of ice will be placed on top and around the samples. Each ice chest will be securely taped shut with fiberglass strapping tape, and custody seals will be affixed to the front, right and back of each cooler.

The Region IX RSCC will be notified daily of the sample shipment schedule (Friday shipments must be reported no later than noon) and will be provided with the following information:

Sampling contractor's name

Name and location of the site

Case number

Total number(s) by concentration and matrix of samples shipped to each laboratory

Carrier, air bill number(s), method of shipment (e.g., priority, next day)

Shipment date and when it should be received by lab

Irregularities or anticipated problems associated with the samples

Whether additional samples will be sent or if this is the last shipment.

9.0 QUALITY CONTROL

9.1 FIELD QUALITY CONTROL SAMPLES

This subsection describes equipment rinsate, field, and/or trip blanks to be collected during the sampling event. In general equipment, rinsate blanks will be collected when reusable, non--disposable sampling equipment (e.g., trowels, hand augers, and groundwater sampling bailers) are being used for the sampling event. Only one blank sample per matrix per day should be collected. If equipment rinsate blanks are collected, field blanks and trip blanks are not required under normal circumstances. Equipment rinsate blanks can be collected for soil, sediment, and ground water samples. A minimum of one equipment rinsate blank is prepared each day for each matrix when equipment is decontaminated in the field. Field blanks are collected when sampling water or air and equipment decontamination is not necessary or a sample collection vessel is not used (e.g., there are dedicated pumps). A minimum of one field blank is prepared each day sampling occurs in the field but equipment is not decontaminated. Trip blanks are required only if no other type of blank will be collected for VOC analysis and when water samples are being collected. If trip blanks are required, one is submitted to the laboratory for analysis with every shipment of samples for VOC analysis. These blanks are submitted "blind" to the laboratory, i.e., packaged like other samples and each with its own unique identification number.

9.1.1 Equipment Blanks

Include this subsection if equipment rinsate blanks will be collected. This is generally the case for FSPs. Only one blank sample per matrix per day, not to exceed the ratio of one blank for every 10 samples, should be collected. If equipment rinsate blanks are collected, field blanks and trip blanks are not usually required.

Include this paragraph if blanks will be analyzed for both metals <u>and</u> organic compounds:

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring HPLC organic--free (for organics) or deionized water (for inorganics) over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for _____[*include types of target analytes, e.g., "metals", "TPHs" or "VOCs"*].

Include this paragraph if blanks will be analyzed <u>only</u> for organic compounds:

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring HPLC organic--free water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for _____[*include types of target analytes, e.g., VOCs" or "TPHs"*].

Include this paragraph if blanks will be analyzed <u>only</u> for metals:

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring deionized water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for metals.

Always include this paragraph:

The equipment rinsate blanks will be preserved, packaged, and sealed in the manner described. A separate sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

9.1.2 Field Blanks

Include this subsection if field blanks will be collected. Only one blank sample per matrix per day should be collected, but not to exceed the ratio of one blank for every 10 samples. Equipment blanks may be substituted for field blanks. If field blanks are prepared, equipment rinsate blanks and trip blanks are not required under normal circumstances.

Include this paragraph if blanks will be analyzed for both metals and organic compounds:

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling procedures. Field blank samples will be obtained by pouring HPLC organic--free water (for organics) and/or deionized water (for inorganics) into a sampling container at the sampling point.. The field blanks that are collected will be analyzed for _____[*include types of target analytes, e.g., "metals" or " VOCs"*].

Include this paragraph if blanks will be analyzed only for organic compounds:

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling procedures. Field blank samples will be obtained by pouring HPLC organic--free water into a sampling container at the sampling location. The field blanks that are collected will be analyzed for _____[*include types of target analytes, e.g., "VOCs" or "TPHs"*].

Include this paragraph if blanks will be analyzed only for metals:

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling procedures. Field blank samples will be obtained by pouring deionized water into a sampling container at the sampling point. The field blanks that are collected will be analyzed for metals.

Always include this paragraph:

The field blanks will be preserved, packaged, and sealed in the manner described. A separate sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

9.1.3 Trip Blanks

Include this subsection if trip blanks will be collected. Only one blank sample per matrix per day should be collected. If equipment rinsate blanks or field blanks are prepared, trip blanks may not be required under normal circumstances.

If trip blanks are to be collected, include this paragraph:

Trip blanks will be prepared to evaluate if the shipping and handling procedures are introducing contaminants into the samples, and if cross contamination in the form of VOC migration has occurred between the collected samples. Trip blanks will be prepared and analyzed for _____ [*Include list of requested analyses*]. A minimum of one trip blank will be submitted to the laboratory for analysis with

every shipment of samples for VOC analysis. Trip blanks are 40mL vials that have been filled with HPLC--grade water and shipped with the empty sampling containers to the site prior to sampling. The sealed trip blanks are not opened in the field and are shipped to the laboratory in the same cooler with the samples collected for volatile analyses.

Always include this paragraph:

The trip blanks will be preserved, packaged, and sealed in the manner described. A separate sample number and station number will be assigned to each trip sample and it will be submitted blind to the laboratory.

9.1.4 Field Duplicate Samples

Duplicate samples are collected simultaneously with a sample from the same source under identical conditions into separate sample containers. A duplicate sample is treated independently of its counterpart in order to assess laboratory performance through comparison of the results. At least 10% of samples collected per event will be duplicates. At least one duplicate will be collected for each sample matrix. Every analytical group for which a standard sample is analyzed will also be tested for in one or more duplicate samples. Duplicate samples should be collected from areas of known or suspected contamination.

Include this paragraph if collecting soil, sediment or other matrix samples:

Duplicate samples will be collected at sample locations _____[*sample locations which will be split for duplicate analysis*]. Duplicate samples will be collected from these locations because _____*[add sentence(s) here explaining the rationale for collecting duplicate samples from these locations; i.e., samples from these locations are suspected to exhibit the highest concentrations of contaminants, or previous sampling events have detected the highest levels of contamination at the site at these locations.]*

Include this paragraph if collecting samples and analyzing for VOCs <u>and</u> other compounds:

Samples to be analyzed for _____[*list all analytical methods for this sample event except for volatiles*] will be homogenized with a trowel in a sample--dedicated 1--gallon disposable pail. Homogenized from the bucket will then be transferred to the appropriate wide--mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., SVOCs) will be filled sequentially before jars designated for another analysis are filled (e.g., metals). Soil samples to be analyzed for volatile organic compounds will not be homogenized. When collecting duplicate soil samples to be analyzed for volatile organic compounds, equivalent portions of sample collected from the same boring will be transferred to both regular and duplicate sample containers.

Include this paragraph if collecting samples and <u>not</u> analyzing for VOCs:

Samples will be homogenized with a trowel in a sample--dedicated 1--gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide--mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g.,SVOCs) will be filled sequentially before jars designated for another analysis are filled (e.g., metals).

Include this paragraph if collecting samples and analyzing <u>only</u> for VOCs:

Samples will not be homogenized. When collecting duplicate samples to be analyzed for VOCs, equivalent portions of sample collected from the same boring will be transferred to both regular and duplicate sample containers.

Include this paragraph if collecting water samples:

Duplicate water samples will be collected for water sample numbers _____ *[water sample numbers which will be split for duplicate analysis*]. Duplicate samples will be collected from these locations because _____[*add sentence(s) here explaining the rationale for collecting duplicate samples from these locations; i.e. samples from these locations are suspected to exhibit the highest concentrations of contaminants or previous sampling events have detected the highest levels of contamination at the site at these locations.*] When collecting duplicate water samples, bottles with the two different sample identification numbers will alternate in the filling sequence (e.g., a typical filling sequence might be, VOCs designation GW--2, VOCs designation GW--4 (duplicate of GW--2); metals, designation GW--2, metals, designation GW--4, (duplicate of GW--2) etc.). Bottles for one type of analysis will be filled before bottles for the next analysis are filled. VOCs bottles will always be filled first.

Always include this paragraph:

Duplicate samples will be preserved, packaged, and sealed in the same manner as other samples of the same matrix. A separate sample number and station number will be assigned to each duplicate, and it will be submitted blind to the laboratory.

9.2 LABORATORY QUALITY CONTROL SAMPLES

Laboratory QC samples are analyzed by the Region IX Laboratory as part of the standard laboratory QC protocols. The laboratory monitors the precision and accuracy of the results of its analytical procedures through analysis of QC samples. In part, laboratory QC samples consist of matrix spike samples and matrix spike duplicates for organic analysis and a duplicate and matrix spike samples for inorganic analyses. Laboratory QC samples are an aliquot (subset) of the field sample. They are not separate samples, but a special designation of an existing sample. A routinely collected soil sample (a full 8oz sample jar or two 120mL sample vials) contains sufficient volume for both routine sample analysis and additional laboratory QC analyses. However, for water samples, double volumes of samples are supplied to the laboratory for its use. Two sets of water sample containers are filled and all containers are labeled with a single sample number. The laboratory is should be alerted as to which sample is to be used for QC analysis by the notation on the sample container label and the traffic report and chain--of--custody record or packing list.

At a minimum, one laboratory QC sample is required per week or one per 20 samples (including blanks and duplicates), whichever is greater. If the sample event lasts longer than 1 week or involves collection of more than 20 samples per matrix, additional QC samples will be designated. For this sampling event, samples collected at the following locations will be the designated laboratory QC samples:

If a matrix is not being sampled, delete the reference to that matrix:

For soil, samples _____[*soil sample numbers designated for QC*]

For sediments, samples _____[*sediment sample numbers designated for QC*]

For water, samples _____[*water sample numbers designated for QC*]

For other matrices, samples _____ [*sample numbers designated for QC*]

Add a paragraph explaining why these sample numbers were chosen to be QC samples. QC samples should be the samples from each matrix expected or known to contain a moderate level of contamination. The rationale

should justify the selection of QA/QC samples based on previously--detected contamination at the site, historic site operations, expected contaminant deposition/ migration, etc.

9.3 FIELD VARIANCES

It is not uncommon to find that, on the actual sampling date, conditions are different from expectations such that changes must be made to the SAP once the samplers are in the field. The following paragraph provides a means for documenting those deviations, or variances. Adopt the paragraph as is, or modify it to project--specific conditions.

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the QA Program will be notified

and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in sampling project report.